

CLAIMS

1. A method of rejuvenating skin, the method comprising applying an acoustic pulse to a dermis layer below a surface of a region of skin with sufficient intensity and duration, and inducing formation of new connective tissue to cause a change in the dermis layer of the skin that

5 results in greater smoothness at the surface of the skin.

2. The method of claim 1, wherein a step of inducing formation of new connective tissue further comprises elevating the temperature of the dermis layer.

10 3. The method of claim 1, wherein the step of applying an acoustic pulse further includes applying a focused ultrasound beam for a time sufficient to cause proteins in the dermis layer to denature.

15 4. The method of claim 1, wherein the step of applying an acoustic pulse further comprises applying a power level in the range of approximately 500 W/ cm<sup>2</sup> to 1500 W/ cm<sup>2</sup> within a target region of the dermis.

20 5. The method of claim 1, wherein the step of applying an acoustic pulse to a dermis layer further comprises focusing a ultrasound beam at a depth below the epidermis in a range between approximately 5 microns and 5 millimeters.

6. The method of claim 1, wherein the step of inducing formation of new connective tissue further comprises inducing cavitation in the dermis layer.

25 7. The method of claim 1, wherein a step of inducing formation of new connective tissue further comprises irritating the dermis layer without adversely damaging the epidermis layer.

30 8. The method of claim 1, wherein the region of skin includes a wrinkle and the method further comprises the step of scanning the focused ultrasound beam over an area occupied

by the wrinkle.

9. The method of claim 8, wherein the step of scanning further comprises scanning the focused ultrasound beam over an area of the skin that is approximately ten times larger than  
5 an area of the wrinkle.

10. The method of claim 1, further comprising a step of cooling the region of skin at least one of before, during, or after the step of applying the acoustic pulse.

11. An apparatus for rejuvenating skin, the apparatus comprising:  
15 an acoustic wave generator for transmitting acoustic waves into a dermal region of skin in response to signals from a driver; and  
a control device constructed and arranged to control the generator to induce the formation of new connective tissue.

12. The apparatus of claim 11, wherein the control device controls the ultrasound waves to elevate the temperature to a range and for a time sufficient to cause proteins in the dermis layer to denature.

13. The apparatus of claim 11, wherein the apparatus further comprises an acoustic lens to focus the acoustic energy at a depth below the epidermis in a range between approximately 5 micrometers and 5 millimeters.

14. The apparatus of claim 11, wherein the control device controls the acoustic waves  
25 to have at least one frequency between approximately ten megahertz and one hundred megahertz.

15. The apparatus of claim 11, wherein the apparatus further comprising a temperature sensor coupled to and providing a temperature signal to the control device.

16. The apparatus of claim 11, further comprising an acoustic receiver, coupled to at  
30 least one of the acoustic wave generator and the control device.

17. The apparatus of claim 11, further comprising a cooling device that cools the temperature of the epidermis layer.

5 18. The apparatus of claim 11, wherein the control device controls the acoustic waves to apply a power level in the range of approximately  $500 \text{ W/cm}^2$  to  $1500 \text{ W/cm}^2$  within a target region of the dermis.

10 19. The apparatus of claim 11, wherein the control device controls the acoustic waves to durations ranging from about 10 nanoseconds to about 200 microseconds.

15 20. A transducer configuration, capable of applying focused acoustic energy to a dermis region of human skin, comprising: a transducer; and an acoustical waveguide disposed adjacent to an acoustic emitting surface of the transducer, wherein a thickness of the acoustical waveguide determines a depth of focus of the acoustic energy in the skin.

20